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Nanism at Sealevel in Western Newfoundland: fig. 1, Solidago macrophylla; fig. 2, Senecio pauperculus; fig. 3, Saxifraga oppositifolia; fig. 4, S. cespitosa; fig. 5, Draba incana.

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 35. April, 1933. No. 412.

IDENTITY OF HEUCHERA HISPIDA PURSH[1]

C. O. Rosendahl, F. K. Butters and Olga Lakela

On the examination of a large amount of material of the genus *Heuchera*, assembled for the purpose of a monographic treatment, the interesting fact appears that there are no reasonably authentic collections of the species currently passing as *Heuchera hispida* Pursh from farther east than the state of Indiana.[2] Since the type of Pursh's species is stated to have come from the "High mountains of Virginia and Carolina," the complete lack of specimens from the whole intervening region, and even from the "type locality" itself at once aroused suspicion. Upon turning to Pursh's original diagnosis, it became apparent at once that what he named and described as *H. hispida* is an entirely different species from the one which has masqueraded in manuals, floras, and even monographs under that name. In order to point out more readily the misconception regarding the identity of Pursh's species, the original description is quoted in full:

[1] Published with aid of a grant to Rhodora from the National Academy of Sciences.

[2] The only apparent exceptions to this statement are the specimens from Dr. Gray's garden, which will be fully discussed later, and a single specimen now in the herbarium of the Missouri Botanical Garden. The latter, which is one of the middle western forms discussed below appears to have been mounted fairly recently, and bears a large label with "George Engelmann, M.D., St. Louis, Mo." printed, and the name "Heuchera americana" apparently in Engelmann's handwriting. It also bears a small and apparently much older label in entirely different handwriting. The data are in almost undecipherable German script, which we interpret as "*Heuchera americana?* Nasswald Meta Ky. Mai 1833." Under the specific name there is pencilled in still a third hand "Richardson?". We cannot pretend to say whether the plant in question really ranges to eastern Kentucky, or whether we have wholly misread the label, or whether perhaps in the obviously long and varied career of the specimen the label may have become mixed.

"H. hispida, scabra; scapo petiolis foliisque subtus glabris, foliis acute lobatis, supra hispido-pilosis dentatis: dentibus brevissimis subretusis mucronatis, pedunculis paniculae pauciflorus, calycibus mediocribus subacutis, petalis spathulatis longitudine calycis, staminibus exertis.

On high mountains of Virginia and Carolina 2|, May, June v. v. Petals purple?"[1]

Up to the time of the appearance of Torrey and Gray's Flora in 1840, no other collections of *H. hispida*, except the ones by Pursh, were apparently known, for in the comments following the description of the species the statement is found, "We are not aware that this species has been collected by any botanist except Pursh (one of whose specimens is preserved in the herbarium of the late Prof. Barton, and another, a very poor one in that of Mr. Lambert) and perhaps by Rafinesque."

Excerpts from Dr. Gray's later writings reveal his keen interest in this obviously rare species of Pursh for in 1841 in his account of a Botanical excursion to North Carolina we find this footnote: "Much to our disappointment we did not meet with *Heuchera hispida*, although I have since learned from an inspection of Barton's Herbarium, that we passed within moderate distance from the place where Pursh discovered it. The habitat given on the original ticket, 'High mountains between Fincastle and Sweet Springs, and some other similar places,' we here cite, with the hope that it may guide some botanist to its rediscovery."[2]

It is interesting to note that two years later Dr. Gray himself happened to become the rediscoverer of the plant as recounted in a letter written to Dr. Torrey on September 30, 1843 from which the following quotation is taken: "I doubt if I got anything of much interest in Virginia except Buckley's (and Nuttall's) Andromeda, Rhamnus parvifolius on the waters of Greenbrier, (where did Pursh get it?), Heuchera pubescens in fruit and Heuchera hispida Pursh!! out of flower and fruit, so that I detected it by the leaves only (and got good roots), not far from where Pursh discovered it, but more west, on the frontiers of a range of mountains where this very local species doubtless abounds."[3]

That Dr. Gray for a number of years regarded *H. hispida* Pursh as a well marked species of very limited range is further evidenced by his comments in 1846 in Silliman's Journal where he wrote as follows:

[1] Pursh, Frederick, Flora Americana Septentrionalis. 1: 188, 1814.
[2] Am. Journ. of Sci. and Arts 42: 16. 1842.
[3] Letters of Asa Gray I: 307, 1893.

"In Giles County soon after crossing the river, live roots of the very rare and distinct species Heuchera hispida Pursh were obtained which have been preserved in cultivation."[1]

From this cultivation four specimens were prepared and preserved in the Gray Herbarium, which, as will be developed later on, appear to be responsible in large part for the rather startling change of heart Dr. Gray experienced between the years 1846 and 1849 regarding the concept and limited range of the species, for in the latter year we find him making the following unqualified assertion concerning its status: "Heuchera hispida Pursh, the rediscovery of which in the mountains of Virginia (in Giles County) I have recorded in Silliman's Journal, second series 1, p. 81, and which I have retained in cultivation in the Cambridge Botanic Garden, is also found in Hancock County, Ill. by Dr. Mead, who has distributed it under the name of H. Richardsonii R. Br.; from which indeed, except that it is a larger and more hairy plant, it does not appear to differ."[2]

In accordance with this broadened concept and in direct contrast with the "scapo petiolis foliisque subtus glabris" of the original diagnosis of Pursh, the species is described in the second edition of the Manual (1856)[3] as being *hispid* or *hirsute*, with long spreading hairs (occasionally almost glabrous). The distribution is given as "Mountains of Virginia. Also Illinois (Dr. Mead) and Northwestward." and *H. Richardsonii* R. Br. is cited as synonym. In subsequent editions of the Manual the range is given as Mountains of Va. to N. C., west to Minn. and E. Kan. In the first edition of Britton and Brown's Illustrated Flora (1897) it is recorded from "Virginia to western Ontario, west to Kansas, Manitoba and the Northwest Territory, south in the Rocky Mountains to Montana and Idaho."

In the monographic treatment of the genus in the North American Flora (1905), Dr. Rydberg rescued *H. Richardsonii* R. Br. from synonymy, and gave its distribution as "subarctic America south to Manitoba, Black Hills of South Dakota and British Columbia." The range of *H. hispida* Pursh was accordingly reduced, still it was accorded a generous territory extending "from Ontario to Assiniboia and Wyoming, south to Virginia and Kansas." Finally in the Flora

[1] Silliman's Journal, Second Series 1: 81: 1846.

[2] Plantae Fendlerianae 4: 55. 1849.

[3] The name does not appear in the first edition as the plant is wholly outside the geographical range of that work.

of the Prairies and the Plains (1932) the distribution is given as "Ont. —Va.—Kans.—Wyo.—Mont." while that of *H. Richardsonii* has become "Man.—S. D.—B. C."

Nothing is known to the authors concerning the present whereabouts of Pursh's "very poor" specimen which Gray saw in Lambert's Herbarium. If it is still in existence it is undoubtedly the type of the species since it was the plant in Pursh's possession when he drew up his description. However, through the kindness of Dr. Francis W. Pennell we have been able to examine Pursh's other specimen cited by Torrey and Gray. This specimen, formerly in Barton's herbarium, is now at the Academy of Natural Sciences, Philadelphia. This, we believe, can be considered as an authentic specimen of Pursh's species. At least Torrey and Gray, who had seen both specimens did not question their identity. The following data are found on the original ticket in Pursh's handwriting: "Heuchera scabra! P. petalis rubris, floribus majoribus. High mountains between Fincastle & the Sweet Springs & some other similar places. P." It is to be noted that the name "hispida" does not occur, but "scabra," the second word in Pursh's diagnosis, does, and Pursh does not use this word in the description of any other species of Heuchera. What caused Pursh to thus alter the epithet and whether he wrote "*hispida*" in place of "*scabra*" on the specimen in Lambert's herbarium are interesting speculations.

Torrey and Gray, enlarging on Pursh's rather brief description, aptly described *H. hispida* Pursh, and their description is quoted here in full: "scape mostly 1–2 leaved, glabrous; radical leaves roundish-cordate, rather obtusely 5–7 lobed, crenate with very broad and short almost retuse mucronate teeth, hispidly ciliate; the upper surface hispid; the lower with the petioles, glabrous, branches of the panicle few-flowered; petals broadly obovate-spatulate, unguiculate, veiny (violet-purple), somewhat longer than the nearly equal calyx segments, a little shorter than the slightly exserted stamens; styles filiform, at length exserted.—Pursh!"[1]

Further, these authors comment: "Resembles the preceding species [*H. pubescens*]; but the flowers are rather smaller, calyx-segments short obtuse. Limb of the petals undulate toward the apex, very broadly spatulate or somewhat rhomboid." This description is so excellent that our only comments are that we think Pursh's

[1] Fl. N. Am. 1: 579–580. 1840.

"staminbus exertis" states the case more accurately than Torrey and Gray's "stamens slightly exserted" (the exsertion amounts to 2–3.5 mm. and this in so small a flower is scarcely slight), that the styles are rather prominently exserted when the flower is in anthesis, and that the flower is about as regular as any in the genus. As thus defined *Heuchera hispida* Pursh is a very local species of the central Alleghenies. Its nearest relative appears to be *H. Curtisii* T. & G. from which it may be distinguished by its broader, undulate-margined petals, and by the hispid upper surface of its leaves. It is in all respects very different from *H. Richardsonii* R. Br., and from the various middle western forms which have been passing under its name, plants with larger, strongly zygomorphic flowers, and for the most part with much hispid hairiness on all their parts.

A very puzzling situation is presented by the four sheets prepared from the plants grown in the Cambridge garden by Dr. Gray. The tickets on two of them bear the following legend: "Heuchera hispida Ph. (1) [or (2)]. The two forms from the same clump. Hort. Cantab. Anno. 1846. e spec Mts. Virg." All the specimens on sheet No. 1 are true *H. hispida* Pursh, while those on sheet No. 2 are entirely different and clearly belong with the so-called *H. hispida* characteristic of the region from Indiana to Missouri and northward to Minnesota. The other two sheets from the Gray Herbarium are dated 1845. Both bear the statement "Hort. Cantab. ex Virginia." Both of them contain a mixture of true *Heuchera hispida* and midwestern forms.

How to account for the appearance of the western form in cultivation in the Cambridge garden in the years 1845 and '46 is indeed a puzzle and the most plausible explanation that occurs to the authors is that either live plants or seeds of the Illinois plant must have been sent to Dr. Gray by Dr. Mead. Dr. Mead's collection was made as early as 1843, the same year that Gray rediscovered *H. hispida* in Virginia, and his specimens contain many ripe seeds. If Dr. Gray planted any of these seeds some may have been washed into the clumps of Virginia plants and have germinated there and Heucheras bloom the second year from seed. At any rate it is quite evident that it was the curious mixture of forms in the garden, and the entire similarity of some of them to Mead's plants which led Gray to expand his conception of *Heuchera hispida* between 1846 and 1849.

All the midwestern plants, which since the publication of Plantae

Fendlerianae have been passing as *H. hispida*, appear to belong to *H. Richardsonii* R. Br.[1] This is a rather polymorphic species of wide range in the western prairies and adjacent regions reaching from western Ontario to the Rocky Mountains, and southward to Kansas, Missouri and Indiana. Southward it appears to hybridize pretty freely into other species. *Heuchera Richardsonii* was described from near the northern limit of its range, "on the rocky banks of rivers from latitude 54° to 64° north." This northern form is characterized by having relatively small leaves 2–6 cm. broad, sparingly hispid or nearly glabrous above, usually more copiously hispid below, especially along the veins. The petioles and stems are glandular puberulent and moderately hispid with short (mostly under 1½ mm.) gland-tipped hairs which are usually nearly wanting toward the base of the stem. This is the plant treated by Rydberg[2] as *H. Richardsonii*, and the range which he gives seems to be essentially correct. It is a plant of the Canadian plains occurring eastward into extreme western Ontario, and westward into the Rocky Mountains, along which it runs south as far as Wyoming. It occurs also in the Black Hills, and in a few stations in the extreme northern parts of Minnesota and North Dakota. It may be called appropriately *Heuchera Richardsonii* var. *typica*.[3]

Southwards in the northern plains states a form of this species occurs with larger leaves, 4–8 cm. broad, and much more copious hispid pubescence, with hairs up to 2.5–3.5 mm. in length. It appears to intergrade completely with the typical form, and no consistent floral differences have been discovered. This is the form which throughout its area has been passing as *H. hispida*. It is a clearly marked geographical variant of *H. Richardsonii*, and as such we are giving it the name *Heuchera Richardsonii* var. *hispidior*.[4] This variety ranges from eastern Montana through the Dakotas and Nebraska to Minnesota, western Ontario, western Wisconsin and

[1] Frankl. Journey 766. 1823.

[2] P. A. Rydberg. North American Flora 22: 107, 1905.

[3] Heuchera Richardsonii var. **typica.** *Heuchera Richardsonii* R. Br., Franklin's Journey p. 766. *sensu stricto.*

We would add as a synonym *H. ciliata* Rydb. Mem. N. Y. Gard. 1: 196, 1900. The floral differences which Rydberg notes as characterizing his species are not significant but occur sporadically in all the forms of the species. Rydberg himself later reduced *H. ciliata* to a synonym of "*H. hispida*" (Flora of the Rocky Mountains and adjacent Plains 382, 1917). The size of leaves, and character of pubescence of his original specimen indicate however that it should be placed here.

[4] Heuchera Richardsonii var. **hispidior,** var. nov. differt a var. *typica* hujus species foliis majoribus, 4–8 cm. latis, petiolis, caulibusque hispidioribus pilis copiosis albis ad 2.5–3.5 mm. longis. *H. hispida* of authors in part, not *H. hispida* Pursh. Type specimen in herb. Minnesota, collected by *O. Lakela* growing in dry soil, Ft. Snelling, Minn., June 14, 1931.

northern Iowa and throughout most of this range it is the only representative of the genus. A full list of the specimens studied will appear in the forthcoming monograph of the genus.

Still farther south and east, in Illinois, Missouri and the adjacent states another variant appears, marked this time by certain slight peculiarities of the floral characters. The inflorescence is somewhat more open, and the flowers a little smaller, while the stamens are more obviously exserted (about 2-3 times the length of the anthers) and the petals are not only glandular, as they are in all the varieties of the species, but are also minutely papillose. In fruit the capsule is somewhat exserted, which is not true of the other varieties. The pubescence is about as in var. *hispidior*, or in some cases even more dense.

This form is probably of somewhat remote hybrid origin. It has much bad pollen, and it forms the first link in a chain of intergrading forms which connects *H. Richardsonii* var. *hispidior* with the western form of *H. americana*. The disposition of most of these forms is left for the monograph now in process of preparation. On account of the wide geographical range of the form now under consideration, and its relatively small divergence from *H. Richardsonii* var. *hispidior* it seems best to treat it as another variety of *H. Richardsonii*. It is the plant which Mead collected in Illinois in 1843, and the plant whose appearance in Dr. Gray's garden in 1845 and 1846 led to the confusion discussed in the first part of this paper. It therefore seems appropriate to call it *Heuchera Richardsonii* var. *Grayana*.[1] It ranges from Kansas to Indiana and northward to central Wisconsin and southeastern Minnesota. In the northern part of its range it intergrades with *H. Richardsonii* var. *hispidior*.

In conclusion, the middle western plants which have been passing as *Heuchera hispida* Pursh are entirely distinct from that species. They are all varieties of *H. Richardsonii* R. Br. These varieties are briefly distinguished in the following key:

1. Capsules included, stamens barely exserted, petals glandular but not papillose
   a. Flowering scapes and petioles moderately hispid with short (1.5 mm. and less) hairs. Leaves 2–6 cm. broad.....*H. Richardsonii* var. *typica*.

[1] Heuchera Richardsonii var. **Grayana,** var. nov. floribus 7–9 mm. longis, petalis et glanduliferis et papillosis, staminibus 2–3 plo longitudine antherarum exsertis, capsulis breve exsertis. *Heuchera hispida*, Gray, Plantae Fendlerianae 4: 55, 1849, as to the western forms there discussed and in part of many later American authors, not *H. hispida* Pursh. Type specimen in the herbarium of the Missouri Botanical Garden, collected by *S. B. Mead* at Augusta, Ill. May 1843.

b. Flowering scapes and petioles densely hispid with long (2–3.5 mm.) hairs. Leaves 4–8 cm. broad. *H. Richardsonii* var. *hispidior*.

2. Capsules more or less exserted, stamens obviously exserted, petals both glandular and papillose . . . . . *H. Richardsonii* var. *Grayana*.

University of Minnesota.

HEUCHERA HISPIDA PURSH REDISCOVERED[1]

Edgar T. Wherry

During the year 1805 Frederick Pursh collected plants in the Appalachian mountain region of Virginia and West Virginia, a number of which were described as new species in his Flora Americae Septentrionalis, which appeared 9 years later. Among these was a *Heuchera hispida*, stated to have the leaves hispid above but glabrous beneath, the peduncles glabrous, and the flowers medium-sized with purple petals and exserted stamens.[2] Through misunderstanding, subsequent authors came to apply this name to a western plant having the peduncles and lower leaf-surfaces more hispid than the upper surfaces. This situation was recognized in the course of a revision of the genus undertaken at the University of Minnesota by Miss Olga Lakela and Professors Rosendahl and Butters,[3] but on borrowing material from various herbaria they were unable to find a specimen corresponding to Pursh's description in any subsequent collection, except a few of material grown by Gray from roots collected in Giles County, Virginia, in 1843. A Pursh specimen of *H. hispida* is fortunately preserved, however, in the herbarium of the Academy of Natural Sciences of Philadelphia, and the label gives its place of collection as "high mountains between Fincastle & the Sweet Springs." On being advised of these facts in the Spring of 1932, the writer decided to endeavor to rediscover the plant, and as soon as the term's class work was over started on a trip, in company with Professor S. C. Palmer of Swarthmore College.

Leaving Swarthmore, Pennsylvania, on June 9th, we made several stops to collect plants en route, and reached Fincastle, Botetourt County, Virginia, in the afternoon of June 12th. Continuing north-

[1] Contribution from the Botanical Laboratory of the University of Pennsylvania. This account of the incidents of the trip supersedes any which has appeared in newspapers and popular magazines.

[2] Flora Americae Septentrionalis 1: 188. 1814.

[3] Cf. the preceding article.

westward from this town, we took an unpaved but fairly good road which led over higher mountain passes than the modern highway, but found only *Heuchera pubescens* Pursh, a widespread species, between there and Newcastle, Craig County. The main highway running north from the latter place (State No. 22) proved to have been recently reconstructed, and though not yet surfaced was wide and well-graded, so even though night was approaching and clouds could be seen to be gathering along the mountain ridges, we ventured to continue on 11 miles to the summit of Potts Mountain, which was reached about 8 P.M.

At the point where the highway crosses the divide, elevation about 2400 feet, we found an openly wooded rocky flat, and had soon selected a parking place for the night. Then, before making any preparations to retire, we got out our flashlights and started to look around to see if any *Heuchera* might be growing there. The fog was almost impenetrable, but in a few moments Palmer's flashlight beam struck a clump of one of them, and a leaf was soon brought closer to the light. It proved to be hispid on top but not beneath, just as Pursh had said, and the flowers, though just beginning to open, agreed wholly with his description. We had rediscovered, at or near the type locality, the real *Heuchera hispida*, not seen growing there for 127 years, and last seen in the wild, in the county next adjoining on the west, by Gray 89 years before.

The following morning we found two or three additional plants in bloom, and several in bud, along with another member of the genus, the well-known *H. villosa* Michaux, not yet showing its inflorescence.

On descending the north side of the mountain, the *H. hispida* proved to be present down to about 400 feet below the summit. Continuing on toward Sweet Springs, we saw a few additional plants of this species high up on Peters Mountain, in both Craig County, Virginia, and Monroe County, West Virginia. None could be found, however, in any other part of the Appalachians visited, from western Virginia to southern Pennsylvania, so it is evidently endemic in a decidedly restricted area.

University of Pennsylvania.

RECENT DISCOVERIES IN THE NEWFOUNDLAND FLORA

M. L. Fernald

(*Continued from page 107*)

Contrasted with the amazingly temperate flora of the peaty tablelands of western Newfoundland, where groups with pronounced austral affinities prevail, there is the abundance at or close to sea-level on the bleak outer coast of western Newfoundland of the arctic and arctic-alpine species. On the exposed coast between latitudes 52° and 48°, from Cape Norman to Cape St. George (and in some cases even southward to Cape Ray), the following members of the flora of the American Arctic Archipelago or of Arctic Greenland (well within the Arctic Circle) occur at or within 100 m. of sea-level. Their latitudinal limits of range on the Atlantic slope of America, as closely as can be determined from the data at hand, is approximately given (omitting fractions of degrees):

Woodsia glabella R. Br. (83°–42°), *Asplenium viride* Huds. (82°–43°), *Festuca brachyphylla* Schultes (82°–44°), *F. vivipara* (L.) Sm. (75°–48°), *F. rubra* var. *arenaria* (Osbeck) Fries (70°–49°), *Poa alpina* L. (76°–47°), *Calamagrostis canadensis* var. *Langsdorfi* (Link) Inman (71°–44°), *C. neglecta* (Ehrh.) Gaertn., Meyer & Scherb. (76°–44°), *Alopecurus aequalis* var. *natans* (Wahlenb.) Fern. (71°–51°), *Hierochloe alpina* (Lilj.) R. & S. (83°–44°), *Eriophorum Scheuchzeri* Hoppe (83°–51°), *Kobresia simpliciuscula* (Wahlenb.) Mackenz. (81°–48°), *Carex capitata* (76°–44°), *C. incurva* Light. (82°–51°), *C. bipartita* All. (76°–49°), *C. glareosa* Wahlenb. (80°–47°), *C. rupestris* All. (81°–48°), *C. scirpoidea* Michx. (76°–43°), *C. glacialis* Mackenz. (79°–48°), *C. bicolor* All. (71°–50°), *C. capillaris* L. (80°–44°), *C. rariflora* (Wahlenb.) Sm. (76°–46°), *C. alpina* Swartz (76°–49°), *C. concolor* R. Br. (81°–44°), *C. microglochin* Wahlenb. (72°–50°), *Juncus trifidus* L. (72°–43°), *J. albescens* (Lange) Fern. (81°–48°), *Luzula spicata* (L.) DC. (76°–44°), *L. campestris* var. *alpina* Gaudin (70°–49°), *Tofieldia minima* (Hill) Druce (76°–48°), *Habenaria straminea* Fern. (69°–51°), *Salix reticulata* L. (73°–51°), *S. arctophila* Cockerell (77°–48°), *Oxyria digyna* (L.) Hill (83°–44°), *Polygonum viviparum* L. (83°–44°), *Arenaria verna* var. *pubescens* (C. & S.) Fern. (83°–44°), *A. cylindrocarpa* Fern. (80°–49°), *Cerastium alpinum* L. (83°–51°), *Lychnis alpina* L. (76°–48°), *Silene acaulis* var. *exscapa* (All.) DC. (83°–44°), *Ranunculus hyperboreus* Rottb. (83°–50°), *R. pedatifidus* var. *leiocarpus* (Trautv.) Fern. (80°–51°), *Thalictrum alpinum* L. (73°–48°), *Cochlearia groenlandica* (83°–51°), *Cardamine pratensis* var. *angustifolia* Hook. (81°–50°), *Draba nivalis* Lilj. (83°–49°), *D. incana* L. (70°–47°), *D. hirta* L. (81°–48°), *D. rupestris* R.

Br. (76°–47°), *Arabis alpina* L. (76°–48°), *Saxifraga cespitosa* L. (83°–48°), *S. aizoides* L. (78°–44°), *S. Aizoon* Jacq. (76°–44°), *S. oppositifolia* L. (85°–44°), *Potentilla nivea* L. (83°–48°), *P. alpestris* Hall. f. (74°–48°), *Dryas integrifolia* Vahl (83°–48°), *Astragalus alpinus* L. (73°–49°), *Epilobium latifolium* L. (83°–48°), *E. lactiflorum* Haussk. (71°–44°), *E. alpinum* L. (73°–46°), *E. Hornemanni* Reichenb. (70°–44°), *Rhododendron lapponicum* (L.) Wahlenb. (81°–44°), *Loiseleuria procumbens* (L.) Desv. (74°–44°), *Arctostaphylos alpina* (L.) Spreng. (76°–44°), *Vaccinium uliginosum* var. *alpinum* Bigel. (81°–44°), *Diapensia lapponica* L. (82°–44°), *Statice labradorica* var. *submutica* Blake (78°–49°), *Euphrasia arctica* Lange (76°–48°), *Bartsia alpina* L. (76°–51°), *Pedicularis flammea* L. (81°–49°), *Gnaphalium norvegicum* Gunn. (72°–49°), *Artemisia borealis* Pall. (76°–48°), *Taraxacum phymatocarpum* (83°–51°) and *Crepis nana* Hook. (70°–51°).

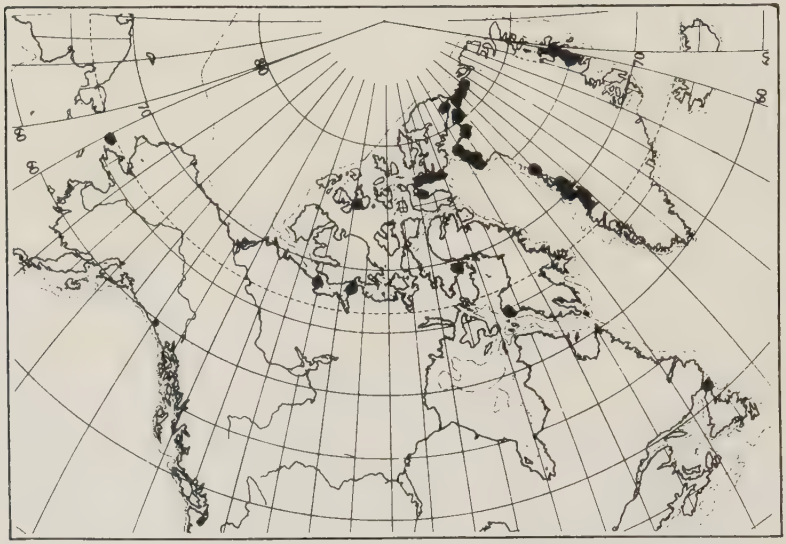
That is a highly impressive list for sea-level between latitudes 52° and 48°, and, were I to include species like *Lycopodium Selago, Scirpus cespitosus* var. *callosus* Bigel., *Stellaria humifusa, Sedum roseum, Empetrum nigrum* and others which reach the New England coast, it would be greatly extended (to 49½ percent of the entire flora of the Archipelago, as enumerated by Simmons). Nor does this arctic flora extend continuously from arctic Greenland or Ellesmereland to western Newfoundland *via* the coast of Labrador. A large proportion of the species are quite unknown on "the Labrador" from Nain (approximately lat. 56°) southward and one or two are not even known from the mountain walls and crests of northernmost Labrador (the Kiglapaits and the Torngats): for example *Taraxacum phymatocarpum* (MAP 12). In describing a dramatic day in 1925 on Burnt Cape (Pistolet Bay), where we first found the Greenland *Habenaria straminea* (unknown between Greenland and northern Newfoundland), I wrote: "When the scattered members of the party assembled at the crest [alt. 223 ft. or 65 m.] . . . I was picking from the crevices a *Taraxacum* which, in its small blackish involucres, was unlike anything we had seen before."[1] I made it out to be the hyparctic *T. phymatocarpum*, known, as stated by Simmons, only in "Northern Greenland, Ellesmereland," but subsequently found southward to lat. 67° in Greenland and lat. 64° on Baffin Island.

Distrusting my own identification, for the species is not known on Labrador, and in northwestern Newfoundland it is within only 223 feet (65 m.) of the sea, I divided the scanty material and sent some to my friend, Dr. Handel-Mazzetti, at Vienna, whose *Monographie der*

[1] RHODORA, XXVIII. 103 (1926).

Gattung Taraxacum (1907) had put the genus in order. His reply was wholly corroborative and when, later, I sent a series to the great Stockholm specialist, Dr. Dahlstedt, I also received a similar reply, Dahlstedt referring "No. 29254 ad *T. phymatocarpum* Vahl, verum."[1]

The contrast, then, between the bleak and rocky coastal rim and foreland of western Newfoundland and the peaty tablelands is complete. At both levels the ubiquitous Hudsonian and Canadian types form a generalized background: a forest or scrub of *Picea*



Map 12. American Range of Taraxacum phymatocarpum.

mariana and *P. glauca* Voss, *Abies balsamea, Larix laricina, Betula papyrifera* and smaller species, *Pyrus* § *Sorbus* and *Populus tacamahacca*, with *Alnus crispa* (or its var. *mollis*), *Salix* (many species), *Ribes glandulosum, Viburnum pauciflorum, Potentilla fruticosa, Lonicera villosa*, etc., with the usual Canadian filicoid and herbaceous

[1] The western Newfoundland and Gaspé collections contain much *Taraxacum lapponicum* Kihlm. In view of the present interpretation of the antiquity of the flora of these areas it was reassuring that Dr. Dahlstedt should write (*in lit.* November 14, 1927): "It has been very interesting to find that *T. lapponicum* (=*T. croceum* Dt.) is distributed also in arctic North America. This collective species . . . is widely distributed in northern and alpine parts of Fennoskandia and occurs also on Iceland and Greenland. It seems to me to be a very old species which surely inhabited the recently covered countries long before the last Skandinavian glaciation."

undergrowth; and the usual Canadian bog plants, with the addition of the almost ubiquitous *Betula Michauxii,* the superabundant *Sanguisorba canadensis* and the usually common *Eriophorum spissum* var. *erubescens* Fern. With this very generalized element almost everywhere, the truly distinctive floras are likely at first to remain masked to the uninitiated; but, once the common run of generally distributed and aggressive species is dismissed from consideration, the flora of the West Coast otherwise quickly segregates into the two contrasted elements which I have sufficiently emphasized: the arctic-alpine dominant at sea-level, the austral dominant on peaty summit-tablelands. The absence or great rarity of many, and often of all, of the Coastal Plain plants at low altitudes from Cape St. George northward is due, presumably, to the extensive calcareous area which makes up most of the lower levels and to the highly magnesian rock of portions of the Lewis Hills and Blomidon and between the North Arm (of Bay of Islands) and Bonne Bay, these furnishing soils toxic, or at least uninviting, to most of the Coastal Plain species. Farther inland and southward, where granitic, gneissic and other silicious rocks prevail, the plants of the acid peats of the tablelands have found welcoming conditions at lower levels, southward even at sea-level.

In an earlier paper, commenting on the close proximity, in some areas, of the arctic and the austral elements in the flora, I said: "In western Newfoundland, similarly, it is quite possible to stand on rock-barrens carpeted with the arctic xerophytes . . . and, by stepping a few feet into the adjacent bogs, meadows, brooksides or thickets, to find one's self in the midst of . . . plants of temperate or even austral range. . . . This intimate commingling of southern species (even Carolinian in some instances) with plants which characterize the Arctic seems, in Newfoundland at least, to be due to the differences of habitat which the two series affect. The arctic types prevail on the dry rocks or on windswept crests, *i. e.* they are primarily controlled in their southern distribution by aridity and bleakness, the climatic features most obviously distinguishing the unglaciated Arctic areas. In describing the climate of the Arctic [American] Archipelago, which, as we have seen, is essentially unglaciated, Simmons says, 'The most prominent and important factor I take its extreme dryness to be,' and this is certainly the most prominent factor in the isolated southern habitats of the arctic plants.

But in Newfoundland, bogs, wet thickets, brooksides and meadows are characterized by southern types and it is in such favorable habitats that all notable extensions [northward] of southern species occur."[1]

Still later, in corroboration of Simmons's statement, that on the American Arctic Archipelago, "The most prominent and important factor I take its extreme dryness to be,"[2] I quoted from Stefansson's *The Friendly Arctic*, Chap. II: "Most of what little snow falls in the far North is soon swept by the wind into the gullies and into the lee of the hills, so that from seventy-five to ninety per cent. of the surface of arctic land is comparatively free from snow at all seasons . . . . a pebble the size of a plum lying on the ground would have more than an even chance of being partly visible above the snow"; and I further wrote: "If a purely botanical demonstration of the rarity rather than the abundance of lakes and swamps [on the unglaciated Arctic Archipelago] were needed an alert phytogeographer would quickly detect it in the absence of freshwater hydrophytes. Simmons admits 204 species of vascular plants to the flora of the Arctic Archipelago, mostly extreme xerophytes, with no true hydrophytes: no species of *Isoëtes, Sparganium, Potamogeton, Callitriche, Myriophyllum* or *Utricularia*. Similarly, all these groups of aquatics were quite unmentioned either in the detailed lists of the floras of arctic Siberia and the Asiatic side of Bering Straits published by Kjellman or in Lynge's very exhaustive study of the Flora of Nova Zembla, an arctic land which was untouched by the different advances of the continental ice-sheets of Europe. But in glaciated Greenland they all occur, there extending northward on the abundantly watered foreland to points varying for the different species from lat. 68° to 72°. Furthermore, the boreal members of the great genus *Epilobium* (excluding § *Chamaenerium*) are typically plants of wet habitats; and, if the Arctic in general were as wet as Campbell and his outgrown sources of information make out, we should expect these wind-dispersed Epilobiums to be everywhere in the Arctic. In wet Greenland they do occur, extending north to lat. 73°, but the Nordenskiöld expedition got none of them on the arctic coast of Siberia (lat. 66°–77°) and Simmons could muster only a single doubtful record for the entire Arctic Archipelago."[3]

[1] Fernald, Mem. Am. Acad. xv. 332 (1925).

[2] Herman G. Simmons, *A Survey of the Phytogeography of the Arctic Archipelago*, Lunds Univ. Årsskr. n. f. Afd. 2, Bd. 9, Nr. 19: 30 (1913).

[3] Fernald, *Campbell's Outline of Plant Geography* (Review), Ecology, vii. 513 (1926)

With the exception of three positive hydrophytes (*Alopecurus aequalis* var. *natans*, *Eriophorum Scheuchzeri* and *Ranunculus hyperboreus*) and a few plants of damp pockets, meadows or shores (*Calamagrostis*, *Carex glareosa*, *bicolor*, *rariflora* and *microglochin*, *Juncus albescens*, *Habenaria straminea*, *Thalictrum alpinum*, *Cardamine*, *Epilobium lactiflorum*, *Bartsia alpina*, etc.), mostly plants of Greenland rather than of the Arctic Archipelago, the truly Arctic species (and their endemic relatives) in Newfoundland are chiefly xerophytes and they are all plants of open and exposed habitats. No better illustrations of the arid condition of this outer coast can be given than the limestone barrens about Old Port au Choix or on Pointe Riche. The vast extent and depth of the long-weathered and superficially arid debris is beautifully exhibited on near-by St. John's Island (PLATE 235).[1]

The coast of western Newfoundland, although fringed late into the spring with ice, which in winter has extended into the Gulf of St. Lawrence or across the Straits of Belle Isle, is not sufficiently cold to be comparable with the true Arctic; and it is decidedly warmer than the north side of the Straits and the outer coast of Labrador, where the south-flowing Labrador current carries icebergs and drift-ice far into the summer. It would seem, then, that the persistence of so extensive an element of the Arctic flora along the outer coast of western Newfoundland is due more to the aridity and the calcareous nature of the exposed ledges and the deep mantle of weathered debris than to low temperature; and that the flora of the rock barrens of the coast of western Newfoundland is largely composed of Arctic species because on these barrens are found arid conditions and calcareous soils comparable with those of much of the Arctic Archipelago where, as Simmons and others before him have pointed out, aridity is "the most prominent and important factor." Since the long-weathered superficial soils have, by continuous leaching, lost much of their alkalinity and have developed carpets of ancient acid peats, oxylophytes, such as *Hierochloe alpina*, *Carex concolor*, *Juncus trifidus*, *Salix Uva-ursi*, *Potentilla tridentata*, *Empetrum nigrum*, *Loiseleuria procumbens* and *Diapensia lapponica*, are not excluded. They, also, are xerophytes and unless the weathered and leached limestones were arid we should scarcely look for them there.

[1] Other illustrations of this arid mantle at sea-level are in RHODORA, XXVIII. t. 153, fig. 2 and t. 154, fig. 3 (1926).

The excessive dwarfing and crowding of internodes, as well as reduction of leaves and increase of blanket-coats of trichomes or other xerophytic modifications of high-arctic and high-alpine plants are familiar to every one. In eastern America it is quite unnecessary, however, to go either to the Arctic or to the alpine summits to get the most beautiful illustrations of such nanism. At sea-level in western Newfoundland (in the latitudes of London, Paris, Berlin, Vienna, Winnipeg, Duluth and Vancouver) the arid limestone gravels supply endless fascinating illustrations (plates 239 and 240). *Solidago macrophylla,* the woodland species of southern Canada and the mountain woods of the northern states, where it attains a height of a meter or more, wandering out to the dry barrens of Newfoundland, will flower when only 3 cm. high (plate 239, fig. 1). *Senecio pauperculus,* in New England and Pennsylvania often 5 or 6 dm. high and with 15–20 heads, is the tiniest of dwarfs (plate 239, fig. 2) on far-from-rich Pointe Riche. *Saxifraga oppositifolia,* which, on the damp walls of the Green Mts., may trail as broad carpets, with internodes up to 1 cm. long and flower-stalks twice as long, on these arid barrens has densely crowded leaves and sessile flowers (plate 239, fig. 3). On cool and damp walls in western Newfoundland and eastern Quebec *Saxifraga cespitosa* L. often has its tufts (cespites) of leaves lax and elongate (up to 1 dm. long), with the thin and fan-like leaves 2 cm. or more long, with scapes up to 2 dm. high. Not so on the extremest of arid sea-shore barrens of Newfoundland (as at Plum Point) where the mats (plate 239, fig. 4) are positively absurd in their condensation. Willows and birches, which in damp and sheltered thickets reach heights of 1–3 m., on these barrens are absolutely prostrate, with stout and ancient matted trunks and marvellously reduced foliage. *Potentilla fruticosa,* "Widdy," which, on damp barrens of Newfoundland, forms knee-high to waist-high dense thickets, abundant and coarse enough to be used as emergency fire-wood,[1] wanders out to dry barrens and becomes almost unrecognizable (plate 240, fig. 1). *Potentilla nivea,* on damp or turfy slopes of Newfoundland or Gaspé often forming loose mats, with leaflets 2.5–3 cm. long, is forced to struggle on the dry gravels, making wonderful little columns (plate 240, fig. 2) dating back a full half-century (as shown by the marcescent bases of old rosettes) and with tap-roots de-

[1] When I asked a native of Bonavista Bay how they prepare "Widdy" for fire-wood, he replied: "We rips up de whole tree, roots and all."

scending straight down for 3 or 4 dm. So with *Lesquerella* (PLATE 240, FIG. 3), the plants reduced to ancient obconic crowns. The succulent (and edible) Roseroot, *Sedum roseum*, on damp rocks growing strong, with many stems 2–3 dm. high and leaves 2–3 cm. long, can stand hard conditions; but the most arid barrens reduce it to a stature often of only 3 cm. *Draba incana* L., given a good opportunity, grows 3 dm. high, with large scattered leaves; but, like the *Sedum*, it can maintain itself on the driest of Newfoundland barrens by condensation to a height of 2 cm. (PLATE 239, FIG. 5). Seaside Plantain, *Plantago juncoides* Lam. (*decipiens* Barneoud), which in favorable conditions may have leaves 2 dm. long and 1 cm. or more broad, with scapes 2 dm. high and spikes 1 dm. long, is almost too minute (PLATE 240, FIG. 4) to be seen in the dry gravel. *Poa alpina* has the leaves distichous, at least theoretically; but the character is often not easily seen in the lush plants of mountain meadows and wet rocks, plants up to 6.5 dm. high, with broad leaves half as long and pyramidal panicles often 1 dm. in diameter. When, however, *P. alpina* gets into the driest of barrens it cuts out all overgrowth and the strongly marked distichous character of the foliage becomes emphasized (PLATE 240, FIG. 5). *Euphrasia*, too, although annual, responds quickly to the arid habitat. On shores with plenty of moisture *E. purpurea* var. *Farlowii* may be loosely branched and 1 dm. high, with internodes 1 cm. long. On the dry barrens, however, it is content with a full height of 1 or 2 cm.

Already nearly half the known species of the Arctic American Archipelago are known from sea-level in western Newfoundland. In view of the fact that in many cases these species are known only as the rarest of localized relics and in view, furthermore, of the vast extent of unexplored barrens on the West Coast, it should not surprise us if, eventually, practically the complete Arctic American flora is found to grow in this arid section of temperate North America.

Part III. Some Taxonomic Results of Recent Collections in Newfoundland.

In the following notes range-extensions chiefly of considerable magnitude are recorded; and, since it has been imperative to study anew many groups, the revisions of such as are largely represented in Newfoundland are included. Some groups, however, still under revision or awaiting fuller study, are necessarily omitted. Besides our own

collections a few others of special note should be mentioned. Mrs. Sinclair Kennedy (Rachel B. Kennedy) has already reported[1] on some of her discoveries in southwestern Newfoundland; Mrs. George W. Jeffers (Anne M. Jeffers) collected in 1929 about Raleigh, on Pistolet Bay, and added materially to our knowledge of that fascinating region; Mrs. Harold Ayre (Agnes M. Ayre) has been very active on the Avalon Peninsula, where she has added some very striking Atlantic European species to the known flora of Newfoundland; in 1930, Mr. K. P. Jansson spent considerable time in the region of Millertown, near where one of my parties had done extensive botanizing in 1911, and, afterward, in a brief trip to Bonne Bay, he added two species to the Newfoundland flora. Some of the more significant of these discoveries by others are added to our own.[2]

Woodsia alpina (Bolton) S. F. Gray. To the very few Newfoundland stations add the following. Bonne Bay: limestone rocks near crest (alt. 650 m.), Killdevil, *Fernald, Long & Fogg*, no. 1115.

W. glabella R. Br. The following are new stations. Bonne Bay: crevices of limestone cliffs, very scarce, Tucker's Head, and crevice of limestone cliff opposite Lomond, *Fernald, Long & Fogg*, nos. 1117, 1118. Lower Humber Valley: very rare, crevices of dry limestone, Hannah's Head, no. 1116.

Thelypteris noveboracensis (L.) Nieuwl. The northern limit in Newfoundland seems to be at Bonne Bay: boggy spruce thickets near Winterhouse Brook, *Fernald, Long & Fogg*, no. 1125.

T. Robertiana (Hoffm.) Slosson. Apparently more frequent on limestones of the West Coast than previously supposed. The following are the new stations. St. John Bay: wooded talus of limestone cliff, Crow's Head, *Fernald, Long & Fogg*, no. 1129. Bonne Bay: talus of limestone cliffs near Stanleyville, no. 1130; bushy talus of limestone cliff, Lord-and-Lady Cove, no. 1131. Bay of Islands: turf over limestone talus, Druid's (or Raglan) Head, no. 1127; spruce thicket at base of limestone cliff west of Big Barachois, no. 1128. Lower Humber Valley: crevices of dry limestone, Hannah's Head, no. 1126. Plant gummy, aromatic; large plants more than 4 dm. high, with fronds 2 dm. broad.

T. cristata (L.) Nieuwl. A new northeastern limit is the following. St. John Bay: bushy swale back of Eddy's (or Old Man's) Cove, *Fernald, Long & Fogg*, no. 1135. Plants fruiting but very small, up to 2.2 dm. high.

*Athyrium Filix-femina (L.) Roth, var. sitchense Rupr. See Butters, Rhodora, xix. 204 (1917). Collections of 1923, misidentified

[1] *Some Additions to the Newfoundland Flora*, Rhodora, xxxii. 3–4 (1930); *Further Notes from Southwestern Newfoundland*, Rhodora, xxxiii, 207–209, tt. 216, 217 (1931).

[2] In the following notes species not previously recorded from Newfoundland are indicated by an asterisk,

NANISM AT SEALEVEL IN WESTERN NEWFOUNDLAND: FIG. 1, POTENTILLA FRUTICOSA; FIG. 2, P. NIVEA; FIG. 3, LESQUERELLA ARCTICA, var. PURSHII; FIG. 4, PLANTAGO JUNCOIDES, var. GLAUCA; FIG. 5, POA ALPINA.

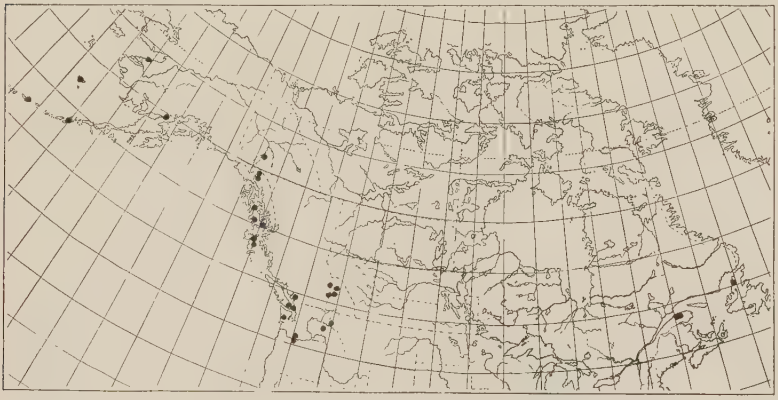
MUHLENBERGIA UNIFLORA, var. TERRAE-NOVAE: FIG. 1, habit, × 1; FIG. 2, spikelet, × 10.

FESTUCA PROLIFERA, var. LASIOLEPIS, TYPE collection: FIG. 3, habit, × 1; FIG. 4, spikelet, × 4.

and distributed as *A. angustum*, var. *rubellum*, prove to be this characteristic plant of northwestern America. The Newfoundland stations follow. Highlands of St. John: thickets below limestone escarpment, western face of Bard Harbor Hill, *Fernald & Long*, no. 27,240; steep springy quartzite banks of brook, Southwest Gulch, Bard Harbor Hill, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,241.

The only other stations known in eastern North America are on the Shickshock Mts. of Gaspé and Matane Cos., Quebec. Map 13.

A. alpestre (Hoppe) Rylands. The plant of Bard Harbor Hill reported in Rhodora, xxviii. 148 (1926) as var. *americanum* seems to be nearer the typical European *A. alpestre* (See Fernald, Rhodora, xxx. 47, 48, tt. 165, 166 (1928)). The following is an addition to the



Map 13. Range of Athyrium Filix-femina, var. sitchense.

Newfoundland collections there cited. Highlands of St. John: wet quartzite rocks along Yellow Brook, Doctor Hill, *Fernald, Long & Fogg*, no. 1153.

Adiantum pedatum L., var. aleuticum Rupr. Typical, especially of magnesian rock, near the West Coast. The following are recent new stations. Bonne Bay: wet rocks by waterfall, Shoal Brook, *Fernald, Long & Fogg*, no. 1163; talus of limestone cliff opposite Lomond, no. 1164. Bay of Islands: wet depressions and borders of rills, serpentine ridge, North Arm, and dry serpentine ridge, North Arm, *Long & Fogg*, nos. 6 and 8; by rill, serpentine ledges, Red Rocks, Lark Mountain, *Fernald*, no. 7.

Typical *Adiantum pedatum* is unknown in Newfoundland, although, through confusion of the French *Capillaire* (*Adiantum Capillus-Veneris*) with the Newfoundland Capillaire or Maidenhair Berry,

Chiogenes hispidula of the *Ericaceae*, it has been reported. Thus, Sir Richard Bonnycastle, writing of Newfoundland plants with assurance but with "first-hand unfamiliarity" with them, naïvely stated: "The maiden hair (adiantum pedatum) is a little trailing plant, seeking sheltered places, and is one of the most beautiful of the family of filices, or ferns. It bears a little fruit, white, and like an ant's egg, which contains so much saccharine matter as to be lusciously sweet when made into a jam or preserve. It is occasionally brought to families here by the girls who follow the berry-picking trade; but it is preserved and not used for capillaire, as in Canada [referring to medicinal use of *Adiantum*]."

Botrychium simplex E. Hitchc. Apparently rare in Newfoundland, but more probably overlooked. The following are recent collections. Bay of Islands: dry gravelly slope, Lark Harbor, *Fernald, Long & Fogg*, no. 18; turfy pasture-slope, Curling, *Fernald, Long & Fogg*, no. 1171; sterile turfy slope, Petrie's, *Fernald & Long*, no. 1172.

*B. angustisegmentum (Pease & Moore) Fernald, Rhodora, xvii. 87 (1915). Bay of Islands: very scarce, on sterile turfy slope, Petrie's, *Fernald & Long*, no. 1174, growing with *B. simplex* and *B. matricariaefolium* A. Br.; the station, indicated to us by Mr. Frank Morris, the first east of central New Brunswick. See p. 95.

Equisetum pratense Ehrh. Reported for the first time in Newfoundland in Rhodora, xxviii. 149 (1926), from St. John Bay. Extending south at least to Bay of Islands: thicket near Morley's Pond, *Fernald, Long & Fogg*, no. 1182.

Lycopodium clavatum L. The northern known limit on the West Coast is on St. John Bay: spruce thicket on dry heath-barren southwest of Port au Choix, *Fernald, Long & Fogg*, no. 1191.

L. obscurum L. The northern known limit on the West Coast is on Bonne Bay: dry spruce woods, Island Cove, Main (or East) Arm, *Fernald, Long & Fogg*, no. 1193.

L. sabinaefolium Willd., var. sitchense (Rupr.) Fern. Rhodora, xxv. 166 (1923). The northernmost station known on the West Coast is on Bonne Bay: peaty and turfy upper quartzite slope (alt. 600–650 m., Killdevil, *Fernald, Long & Fogg*, no. 1195.

*L. complanatum L., var. canadense Victorin, Contrib. Lab. Bot. Univ. Montréal, no. iii. 70 (1925). Bay of Islands: peaty and gravelly thicket, French (or Tweed) Island, *Fernald, Long & Fogg*, no. 34.

L. tristachyum Pursh. The northern known limit on the West Coast is in the Lower Humber Valley: dry limestone gravel, Hannah's Head, *Fernald & Long*, no. 1196.

Pinus Strobus L. The northern limit on the West Coast seems to be at Bonne Bay, where, we are told, it has been common on sheltered areas. The extraordinary *f. prostrata (Mast.) Fern. & Weath.,

Rhodora, xxxiv. 168 (1932), occurs on the bleak serpentine mountains of Bay of Islands: Blomidon, *Mackenzie & Griscom*, no. 10,032; North Arm, *Long & Fogg*, no. 37. See p. 11.

Typha latifolia L. Bonne Bay: bushy margin of open savannah near mouth of Main River, plants all sterile, *Fernald & Long*, no. 1202.

Said by Mr. W. A. Preble to be abundant, and regularly harvested for "flags" in barrel-making, at Baker Brook, 12 miles north of Bonne Bay. See p. 90.

Sparganium multipedunculatum (Morong) Rydb. See Fernald, Rhodora, xxvii. 190 (1925). To the two recorded stations in Newfoundland add the following. Avalon Peninsula: 20-Mile Pond (Windsor Lake), *A. M. Ayre*. Bay of Islands: marshy border of pond at foot of serpentine ridge, North Arm, *Long & Fogg*, no. 42.

Potamogeton confervoides Reichenb. The northernmost known stations are at Bonne Bay: shallow pools in bog-barrens at 400–550 m. alt., tableland of Lookout Mountain, *Fernald, Long & Fogg*, no. 1206; alpine ponds, July 28, 1930, *K. P. Jansson*. See p. 85.

P. gramineus L., var. spathulaeformis Robbins. To the very few Newfoundland stations add St. John Bay: shallow marl-pond in limestone barren, Eastern Point, *Fernald, Long & Fogg*, no. 1209.

P. praelongus Wulfen. To the small number of Newfoundland stations add Bay of Islands: Morley's Pond, *Fernald, Long & Fogg*, no. 1211. See p. 14.

P. bupleuroides Fern. The northernmost known station is at the head of Bonne Bay: brackish tidal mud-flats at mouth of Main River, *Fernald, Long & Fogg*, no. 1212.

*Ruppia maritima L., var. obliqua (Schur) Aschers. & Graebn. See Fernald & Wiegand, Rhodora, xvi. 123 (1914). Bonne Bay: brackish tidal mud-flats at mouth of Main River, *Fernald, Long & Fogg*, no. 1214. See p. 91.

*R. maritima, var. intermedia (Thedenius) Aschers. & Graebn. See Fernald & Wiegand, l. c. 124 (1914). Bonne Bay: with the latter in brackish tidal mud at mouth of Main River, *Fernald, Long & Fogg*, no. 1215.

Heretofore known in eastern North America only from Rimouski Co., Quebec (Trois Pistoles, *Fernald & Pease*, no. 24,826). See p. 91.

*R. maritima, var. brevirostris Agardh. See Fernald & Wiegand, l. c. Bonne Bay: with the two preceding, brackish tidal mud-flats at mouth of Main River, *Fernald, Long & Fogg*, no. 1216.

Heretofore known in America only from pools on the Côte Nord, the Mingan Islands and the Magdalen Islands. See p. 91.

*R. maritima, var. rostrata Agardh. See Fernald & Wiegand, l. c. 125. District of Burgeo and La Poile: pool in brackish sand back of Sand Bank, west of Burgeo, *Fernald, Long & Fogg*, no. 47. Bay of Islands: brook in salt marsh, Lark Harbor, no. 46.

Scheuchzeria palustris L., var. americana Fernald, Rhodora, xxv. 178 (1923). The northernmost known station in Newfoundland is on Bonne Bay: open savannah near mouth of Main River, *Fernald & Long*, no. 1221.

Festuca capillata Lam. As already noted, *F. capillata* is a part of the indigenous flora of southern Newfoundland, already recorded from southeastern and southwestern districts. An intermediate station is in Burgeo and La Poile: dry peaty crests of gneiss hills near Sand Bank, west of Burgeo, *Fernald, Long & Fogg*, no. 57.

Festuca rubra L. This complex species (often treated as several species) is highly developed in Newfoundland. As an aid to identification of these diverse plants the following key to those occurring in eastern America is proposed.:

a. Foliage comparatively soft, not strongly whitened (except in f. *glaucescens*)....*b.*
  b. Lemmas glabrous, scabrous or merely strigose-hirsute: panicles up to 2.3 dm. long, often with elongate branches....*c.*
    c. Basal leaves setaceous or linear-involute, 0.5–1 mm. in diameter....*d.*
      d. Basal offshoots all or in great part divergent or decumbent, forming loose mats....*e.*
        e. Lemmas distinctly awned....*f.*
          f. Lemmas glabrous....*g.*
            g. Spikelets 7–10 mm. long, with 3–7 florets: 2d glume 3–4.5 mm. long: body of 1st lemma 4–6 mm. long.
              Foliage green....*F. rubra* (typical).
              Foliage whitish....Forma *glaucescens*.
            g. Spikelets 1–1.7 cm. long, with 6–10 florets: 2d glume 4–6 mm. long: body of 1st lemma 6–8 mm. long....Forma *megastachys*.
          f. Lemmas puberulent or strigose-hirsute....Forma *squarrosa*.
        e. Lemmas awnless or merely mucronate....Var. *mutica*.
      d. Basal offshoots all erect, intravaginal, with leaves mostly elongate (1.5–6 dm.) and erect: culms tall (2.5–9 dm.)
        Var. *commutata*.
    c. Basal and cauline leaves all flat, 1.5–3 mm. broad: spikelets 1–1.7 cm. long, 6–10-flowered: body of 1st lemma 5.5–7 mm. long....Var. *multiflora*.
  b. Lemmas densely villous to lanate: panicle narrow and spiciform or with short branches, 0.5–1.5 dm. long: spikelets 1–1.5 cm. long....Var. *arenaria*.
a. Foliage stiff, somewhat wiry, strongly whitened: spikelets 0.9–2 cm. long, 6–10 flowered: body of 1st lemma 5–7.5 mm. long, glabrous....Var. *juncea*.

F. rubra (typical). Turfy, gravelly or rocky slopes and shores, or in mossy bogs and thickets, common (except on the highest summits) throughout Newfoundland. Forma glaucescens (Hartm.) Holmb., not yet noted. Forma squarrosa (Fries) Holmb. (Var. *subvillosa* Mert. & Koch). Bay of Islands: Wild Cove, *Waghorne*, no. 39; cliffs near Frenchman's Cove, *Mackenzie & Griscom*, no. 10,096.

Forma MEGASTACHYS (Gaud.) Holmb. NOTRE DAME BAY: Baccalieu Island, July, 1902, *Sornborger;* shores of Pike's Arm, *Fernald, Wiegand & Bartram,* no. 4662.

*F. RUBRA, var. MUTICA Hartm. Extending from Greenland south to Newfoundland, Anticosti and the Gaspé Peninsula. EXPLOITS VALLEY: railroad gravel, Millertown Junction, *Fernald, Wiegand & Darlington,* no. 4658. HIGHLANDS OF ST. JOHN: springy cliffs and talus above Overfall of Deer Pond Brook, *Wiegand, Gilbert and Hotchkiss,* no. 27,376.

*F. RUBRA, var. COMMUTATA Gaud. (Var. *fallax* (Thuill.) Hackel). EXPLOITS VALLEY: portage route from Depot Camp on Mary Ann Lake to Junction Brook, *Fernald, Wiegand & Bartram,* no. 4661; gravelly bank near Rushy Pond, *Fernald, Wiegand, Bartram & Darlington,* no. 4667. BAY OF ISLANDS: boggy meadows and wet grassy slopes, Birchy Cove (Curling), *Fernald, Wiegand & Kittredge,* no. 2672.

*F. RUBRA, var. MULTIFLORA (Hoffm.) Aschers. & Graebn. AVALON PENINSULA: gravelly railroad bank between Waterford Bridge and St. John's, *Fernald & Wiegand,* no. 4666. HA-HA BAY: strand south of Raleigh, *Wiegand, Gilbert & Hotchkiss,* no. 27,375. BAY OF ISLANDS: woods and thickets on slaty brookside, Curling, *Fernald, Long & Fogg,* no. 1230.

*F. RUBRA, var. ARENARIA (Osbeck) Fries. AVALON PENINSULA: damp mossy or turfy hollows on hill south of St. John's, *Fernald & Wiegand,* no 4664. VALLEY OF GANDER RIVER: dry gravelly bank, Glenwood, *Fernald, Wiegand & Darlington,* no. 4667. BONNE BAY: limestone ledges and talus, Shag Cliff, *Fernald, Long & Fogg,* no. 1233. BAY OF ISLANDS: turfy spots on slaty calcareous talus, Cutwater Head, *Fernald, Long & Fogg,* no. 1231; meadow on Governor Island, *Eames & Godfrey,* no. 5872.

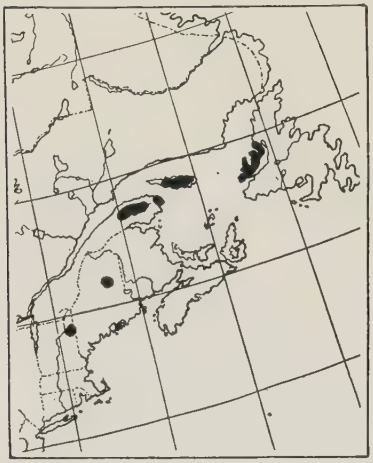
*F. RUBRA, var. JUNCEA (Hackel) Richter. AVALON PENINSULA: rocky soil, base of cliff, Bell Island, Conception Bay, *Howe & Lang,* no. 1283. BONNE BAY: serpentine tableland, Bonne Bay, *Fernald, Wiegand & Kittredge,* no. 2669. BAY OF ISLANDS: gravelly shore, Blomidon Brook, *Mackenzie & Griscom,* no. 10,095. BAY ST. GEORGE: Barachois Brook, *R. B. Kennedy,* no. 37.

FESTUCA **prolifera** (Piper), comb, nov. *F. rubra prolifera* Piper, Contrib. U. S. Nat. Herb. x. 21 (1906). MAP 14.

The alpine plant of the highest mountains of New Hampshire, Maine, Quebec and Newfoundland (as well as lower stations on the limestones of Gaspé, Anticosti and Newfoundland) has never seemed to me like a mere viviparous state of the lowland *Festuca rubra* L., a species which abounds at sea-level and primarily on silicious soils throughout the coastal area from Labrador to New Jersey and even to the Carolinas. Yet, when he published it as a subspecies Piper hesitated to accord it rank higher than a "state" of *F. rubra.*

> The plant of the White Mountains which has been referred to *F. ovina vivipara* L. is in reality a viviparous form or state of *F. rubra*, differing only in its viviparous spikelets. It is said to be the only form of the plant in the White Mountains, and while properly a state rather than a subspecies, may be named as above. It seems surprising that no similar form occurs in Europe.

Since Piper wrote the above paragraph I have had much experience with the alpine plant. In its reddish and membranaceous basal sheaths coarsely ribbed and quickly disintegrating into loose fibers and its usually loose habit of growth, it is certainly nearer to the complex *Festuca rubra* L. than to *F. ovina* L. and the other eastern North American relatives of *F. ovina*, *F. brachyphylla* Schultes, *F. vivipara* (L.) Sm.[1] and *F. capillata* Lam., in all of which the basal sheaths are whitish and coriaceous, scarcely costate and not readily disintegrating. In the latter group of species (Sect. *Ovinae*, subsect. *Intravaginales* Hackel) the anthers are only one-third to one-half as long as the palea; in *F. ovina* 2.5–3 mm. long, in *F. brachyphylla* 0.5–1 mm., in *F. vivipara* unknown, in *F. capillata* 1.5–2 mm. *F. rubra*, however, in its multiform variations has the anthers longer, one-half to three-fourths the length of the palea, in our eastern American varieties 2.5–4.5 mm. long.



Map 14. Range of Festuca prolifera.

Ordinarily the alpine *Festuca prolifera* of calcareous to circumneutral areas does not bear fertile spikelets, but in 1929, on the limestone cliffs about Bonne Bay in Newfoundland, Messrs. Long, Fogg and I were fortunate enough to secure it with the normal simple racemes of viviparous spikelets mixed on some individuals with non-viviparous spikelets bearing anthers. The well developed anthers are only 1.5–2 mm. long; and the well developed lemmas are awnless, either quite muticous or merely attenuate to pointed, but not with awned tips. Similar lemmas are found on all specimens in which they have not

[1] For note on the specific distinctions of *F. vivipara* see Fernald, Rhodora, xxviii. 151 (1926).

changed to leafy tufts and in texture they are decidedly more membranaceous than in *F. rubra*. The latter species, except in rare cases (in which, however, the large anthers are regularly developed) has distinctly awned lemmas. In *F. rubra*, likewise, the inflorescence in all well developed plants is clearly a panicle, with at least the lower branches forking, bearing 9–70 firm spikelets, or in some of the arctic forms with the spikelets closely crowded. In *F. prolifera*, on the other hand, the inflorescence is a simple flexuous raceme of 3 to 8 spikelets, the lowest branch rarely bearing a second sessile spikelet.

With many morphological characters and great constancy and with a very definite restriction to cold or alpine habitats in calcareous or other basic or neutral soils, *Festuca prolifera* seems to be a clear-cut endemic species of eastern North America. In its basal sheaths and loosely cespitose to subrepent habit it is related to *F. rubra*. In its awnless and membranous lemmas and in its almost uniformly proliferous habit it is close to *F. vivipara*, which reaches its southern limit at the northern limit of *F. prolifera* (the Shichshock Mts. and western Newfoundland). In its membranous and awnless lemmas it is similar, also, to *F. brachyphylla*, which extends south to western Newfoundland, the Shickshock Mts. and northern Vermont, but which has the basal sheaths of *F. ovina* and the anthers only 0.5–1 mm. long. In size of anther *F. prolifera* matches *F. capillata* but there the resemblance ceases, *F. capillata* with the sheaths of *F. ovina*, densely cespitose habit, and short coriaceous or chartaceous tightly inrolled lemmas.

Festuca prolifera occurs in two extremes: the typical plant of the White Mountains and the Gaspé Peninsula, as well as southwestern Newfoundland, with glabrous spikelets; and the more northern plant (of midwestern Newfoundland and Anticosti), with lemmas pilose. The two extremes are represented by the following collections.

F. PROLIFERA (typical). Spikelets glabrous.—NEWFOUNDLAND: shelves of limestone cliff, Druid's (or Raglan) Head, Bay of Islands, *Fernald, Long & Fogg*, no. 1235; talus slope of the marble region between Mt. Musgrave and Humbermouth, *Fernald, Wiegand & Kittredge*, no. 2670, in part (mixed with *F. brachyphylla*); dry limestone barrens, upper slopes and tablelands, alt. 200–300 m., Table Mt., Port au Port Bay, *Fernald, Wiegand & Kittredge*, no. 2668 (transition to var. *lasiolepis*), *Fernald & St. John*, no. 10,788. QUEBEC: abrupt western calcareous slopes, alt. 1000–1100 m., Tabletop Mts., *Fernald & Collins*, no. 364; wet rocks and chimneys, alt. 825–1125 m., Northeast Branch of R. Ste. Anne des Monts, Tabletop Mts.,

Fernald, Dodge & Smith, no. 25,433; gravelly and sandy beaches and bars, R. Ste. Anne des Monts, *Fernald & Collins*, no. 415; damp rocks, waterfall of Ouillet Brook, Mt. Fortin, *Fernald & Pease*, no. 24,904; wet calcareous cliffs and ledges, northern base of Mt. Collins, *Fernald, Griscom, Mackenzie, Pease & Smith*, no. 25,431; dry talus and ledges of green schists, alt. 900–1125 m., Hanging Valley, Mt. Pembroke, *Griscom & Pease*, no. 25,432; cold chimneys in the schists at about 900–1000 m. alt., Fernald Pass, Mt. Mattaouisse, *Fernald & Smith*, no. 25,434. Maine: slide, West Wall of North Basin, Mt. Katahdin, July 13, 1900, *Fernald*. New Hampshire: in alpinis Montium Alborum, *Wm. Oakes;* White Mountains, in alpibus cum *Oxyria, Tuckerman;* alpine brooks, Mt. Washington, September 2, 1877, *Pringle* (type-collection); Gulf of Mexico, Mt. Washington, August 5, 1855, *Wm. Boott;* Great Gulf, Mt. Washington, July 29, 1887, *Faxon*, July 7, 1895, *Kennedy, Churchill*, August 10, 1896, *Faxon;* head of Great Gulf, alt. 5500 ft., *Pease*, no. 12,878; Alpine Garden above Raymond's Cascade, Mt. Washington, August 5, 1897, *E. F. Williams*.

*Var. **lasiolepis**, var. nov. (tab. 241, figs. 3 and 4), lemmatibus pilosis.—Calcareous region of western Newfoundland and Anticosti Island. Newfoundland: limestone cliffs near Stanleyville, Bonne Bay, August 9, 1929, *Fernald, Long & Fogg*, no. 1236 (type in Gray Herb., some spikelets fertile); talus of limestone cliff opposite Lomond, Bonne Bay, August 19, 1929, *Fernald, Long & Fogg*, no. 1237; turfy slopes below limestone crests (alt. 650 m.), Killdevil, no. 1238; dry humus over limestone ledges and shingle, Hannah's Head, lower Humber valley, July 12, 1929, *Fernald, Long & Fogg*, no. 1242. Quebec: Rivière Vaureal, Anticosti, 28 juillet 1925, *Victorin, Rolland-Germain & Louis-Marie*, no. 20,578; humus humide sur le calcaire, R. au Fusil, Anticosti, 19 août 1926, *Victorin & Rolland*, no. 24,775; dans l'humus humide calcaire, R. Jupiter, Anticosti, 12 août 1926, *Victorin & Rolland*, no. 24,776 (passing to typical *F. prolifera*); cailloutis calcaires, R. Galiote, Anticosti, 14 août 1926, *Victorin & Rolland*, no. 24,782; sur les platières récentes, avec *Braya humilis*, etc., R. Chicotte, Anticosti, *Victorin & Rolland*, no. 27,872; le long des rivages calcaires, R. de la Chute, Anticosti, 21 juillet 1927, *Victorin & Rolland*, no. 27,884; sur les platières en haut des gorges, R. au Fusil, Anticosti, 20 juillet 1927, *Victorin & Rolland*, no. 27,885.

Poa laxa Haenke. An additional station on the Highlands of St. John: quartzite cliffs and ledges of Deep Gulch, Doctor Hill, *Fernald, Long & Fogg*, nos. 1252, 1253. See p. 58.

P. trivialis L. As stated on p. 83, *Poa trivialis* has every appearance of being indigenous (though sometimes also introduced) in Newfoundland. Near the West Coast it is typical of peaty openings, glades or shores as well as on cliffs and talus or around springy spots.

P. saltuensis Fern. & Wieg., var. microlepis Fern. & Wieg. Rhodora, xx. 124 (1918). The northern limit seems to be on Bonne Bay: woods and thickets near mouth of Middle Brook, *Fernald, Long & Fogg*, no. 1275.

Dactylis glomerata L. In eastern North America the Eurasian Orchard Grass is thoroughly naturalized. Three of the varieties occur with us (two of them in Newfoundland, the third likely to be found there). Typical D. glomerata, common near settlements as far north as Bonne Bay, has the glumes and lemmas with long-ciliate keels but glabrous backs. Var. *ciliata* Peterm. (not yet known in Newfoundland) is similar, but with glumes and lemmas pubescent on the back.

*D. glomerata, var. detonsa Fries. Keels merely scabrous or short-hispid, not long-ciliate. Bonne Bay: swale at old camp-site, mouth of Main River, *Fernald, Long & Fogg*, no. 1276. Probably introduced in hay or straw, and presumably more generally naturalized.

Cynosurus cristatus L.

In his unpublished manuscript, *Essai sur la Flore de Terre-Neuve et des Iles St. Pierre et Miclon*, based on his collections made from 1816–1820, and preserved in the general library of the Muséum d'Histoire Naturelle at Paris, where I had the privilege of consulting it in September, 1930, through the great kindness of the Chief Librarian, Dr. Léon Bultingaire, and his very helpful assistant, Mme. de Mouricaud, Bachelot de la Pylaie seemed to regard *Cynosurus* as indigenous in Newfoundland and the French Islands: "Cette espèce croît à l'ile St. Pierre dans les terrains inférieurs, parmi les autre graminées qui forment des espèces du prairieux naturelles: elle se trouve aussi à Terre-neuve dans semblables localités, le long des ruisseaux et des rivières, au bord des bois." The numerous collections from about the Bay of Islands and from the Avalon Peninsula (*Mrs. Ayre*) seem to be introductions; and Brother Arsène considered it (Rhodora, xxix. 207) an introduction on St. Pierre et Miquelon.

In the same manuscript La Pylaie recorded *Molinia caerulea (L.) Moench as a native of boggy barrens near the West Coast, saying (under *Melica caerulea* L.): "Cette plante croît dans les landes dures et marécagueses qui se trouvent sur la côte occidentale de Terre-neuve, à une certain distance du rivage: elle est rare. . . La plante ne diffère pas de celle qui croît en Europe." As yet this rare species has not been rediscovered in western Newfoundland but the habitat is right for *Molinia*, which should confidently be sought.

Catabrosa aquatica (L.) Beauv., var. **laurentiana**, var. nov. (tab. 242, figs. 3 and 4), foliis caulinis subacutis vel obtusis nec apice rotundatis; culmo valde grosseque sulcato; paniculis contractis lanceolatis vel anguste ovoideis 2–16 cm. longis 1–8 cm. diametro, internodiis imis 0.7–3 cm. longis, ramis horizontaliter patentibus ad

basin versus floriferis; spiculis ochroleucis vel purpurascentibus 1–2-floris; lemmatibus 2–3 mm. longis.—Springs, rills, pools and fresh to brackish marshes, near the coast, southeastern Labrador, Newfoundland, southeastern Quebec, Magdalen Islands, Prince Edward Island and northeastern New Brunswick. Labrador: Seal Islands, 1900, *E. B. Delabarre.* Newfoundland: swaley margin of pool in limestone barrens, Capstan Point, Flower Cove, *Fernald, Long & Dunbar*, no. 26,286; turfy and gravelly beaten paths (stunted individuals), Flower Cove, *Fernald & Long*, no. 27,434; borders of springs at foot of limestone sea-cliffs, base of Pointe Riche, *Fernald, Long & Fogg*, no. 1277; wet runs and boggy spots in limestone barrens, near sea-level, Ingornachoix Bay, *Fernald, Wiegand & Kittredge*, no. 2601; boggy brooklet, Channel, *Howe & Lang*, no. 811; cold spring-ditch, Port aux Basques, *Fernald, Long & Dunbar*, no. 26,285. Quebec: wet places, Blanc Sablon ("Labrador"), *Fernald & Wiegand*, no. 2600; springy marsh near the shore, Harrington, *St. John*, no. 90,142; sur les rivages calcaires, Pointe-aux-Ammonites, *Victorin & Rolland*, no. 18,225; rivages du lac Salé, Ile à la Chasse, Archipel de Mingan, *Victorin & Rolland*, no. 25,881; le long de la petite rivière, Pointe de l'Est, Anticosti, *Victorin & Rolland*, no. 27,800; cold brook at edge of salt marsh, Ste. Anne des Monts, *Collins & Fernald*, no. 28; border of salt marsh, Capucins, July 28, 1922, *Fernald & Pease*, no. 24,867 (type in Gray Herb.); abundant in a cold brook, mouth of Bonaventure River, July 31, 1902, *Williams & Fernald;* August 2, 3 & 4, 1904, *Collins, Fernald & Pease;* springy holes at edge of salt marsh, Bic, *Fernald & Collins*, no. 872; brackish shore, Cacouna, *Victorin*, no. 595; shore of St. Lawrence, Temiscouata, August 7, 1879, *Pringle;* vicinity of Cap à l'Aigle, *J. Macoun*, no. 68,967. Magdalen Islands: brook in springy marsh and wet sand, Grindstone Island, *Fernald, Bartram, Long & St. John*, nos. 6882, 6883; sur les dunes humides, Ile du Hâvre-au-Ber, *Victorin & Rolland*, no. 9040. Prince Edward Island: cold springy shore, Southport, *Fernald & St. John*, no. 6881; spring-fed marsh, Southport, *Fernald & St. John*, in Pl. Exsicc. Gray. no. 121. New Brunswick: fresh to brackish marshy ground, Dalhousie, *Fernald & Pease*, no. 24,868.

I am unable to place the plant of cold springs, rills and pools in eastern Canada, Newfoundland and Labrador with any of the described variations of *Catabrosa aquatica.* The aggregate species has a wide range across Eurasia, north to subarctic regions; in western North America, from Alaska to the Saskatchewan, south, chiefly in the mountains, to Arizona, Colorado and Nebraska; and borders of the Gulf of St. Lawrence and the Straits of Belle Isle. In the latter area, where the plant abounds in cold waters near the fisheries, it might easily be taken to be a recent introduction from Europe, especially as it is as greedily eaten by the cattle as the European plant

and, apparently, spread by them to wet cowtrails and roads some distance from the pools in which it truly luxuriates. So generally have we come to associate the grass with the cattle-infested areas, where it is difficult to secure good specimens, that frivolous and classical members of my parties have nicknamed it "Cattlebrows'er,"[1] the name *Catabrosa* itself referring to the erose or *nibbled* margins of the glumes and lemmas.

Var. *laurentiana* is nearer to *Catabrosa aquatica*, var. *uniflora* S. F. Gray, than to other varieties of the species. Typical *C. aquatica* is apparently the large European plant with the cauline leaves rounded at tip; the panicles very long (mostly 1–2.5 dm. long), with delicate capillary whorled branches up to 1 dm. in length, whence one of the English names, WATER HAIR-GRASS. In the well developed panicles (1.5–2.5 dm. long), shown in FIG. 1, the lowest whorls are 3–6 cm. apart, the longer branches (4–10 cm. long) are spikelet-bearing chiefly above the middle and until very mature are slightly ascending. The spikelets are 2 (sometimes 3 or 4)-flowered. The culms (just above the

[1] I realize that, in putting on record such pleasantries, which often relieve the monotony of "changing driers" and of "salivating" specimens, there is danger of being wholly misunderstood by those who lack the "Yankee sense of humor." At least, when I recorded one of our bits of botanical humor in 1926 the effort fell flat. Writing of *Carex microglochin*, "one of the rarest and taxonomically most interesting of species, having the primitive rachilla, which is obsolete in most modern *Carices*, projecting from the tip of the perigynium," so that it is "about as well placed in the Antarctic genus *Uncinia* as in the great genus *Carex*," I wrote, in would-be humorous vein: "Consequently, when we first came upon this unpretentious but truly aristocratic plant, scattered and rare as we felt it ought to be, we carefully dug the individuals and gently tucked their bristly tops into paper bags that we might lose none of the precious fruits; at that stage we spoke of it by its full name, *Carex microglochin*, and had a feeling that we ought to give it some title. A little later, finding it more common than the few straws in herbaria could possibly suggest, we began to feel familiar and called it 'Mike'; then, as the weeks wore on and we saw it in every low place in the lime-barrens, we referred to it as 'Mike O'Glochlin;' and before we had left the Straits Coast, noticing that it followed many paths where its prickly little fruits had obviously been spread by pedestrians with their high skin-boots, our attitude had completely changed and we spoke of it as 'Mike O'Glochlin, the Bootlegger'."—Fernald, RHODORA, XXVIII. 61 (1926).

This was intended as an obvious joke; but the greatest humor in the series was reached only when the matter was re-served by the most prominent of British local botanists, my friend, the late Dr. Druce of Oxford, whose remarkable array of degrees and honors (M.A., D.Sc., LL.D., F.R.S., F.L.S.) bespoke his botanical reputation: "At Capstan Point they found a wonderful Arctic flora which included the 'excessively local relic-species' having the primitive rachilla, which is almost obsolete in modern sedges, projecting from the top of the perigynium. They familiarly called it 'Mitre Oglochin,' noticing that it had been spread along many paths by the high skin boots of pedestrians to which the prickly little fruits had become attached."—Druce. Bot. Soc. Exch. Cl. Brit. Isl. Rept. viii. 339, 340 (1928). The fishermen of the Straits of Belle Isle are not bishops, although my characterization of *Carex microglochin* as "truly aristocratic" may have created the impression that it frequently associates with "mytrede bisshopes."

upper leaf) are closely and shallowly furrowed (fig. 2). Var. *uniflora* (var. *subtilis* Hook.), as shown by Lange, Fl. Dan. xvii. fasc. li. 3, t. mmmii. fig. 2 (1883), and by many European specimens (see figs. 5 and 6), is very similar to the newly proposed var. *laurentiana* in having the cauline leaves narrowed to tip, the culms coarsely furrowed, the panicle comparatively small and the spikelets mostly 1-flowered; but the panicle is lax and open as in typical European *C. aquatica*, with the branches subascending until mature. The Rocky Mountain representative of the species (figs. 7 and 8) seems to be var. *uniflora*.

(*To be continued*)

CHARLES ALBERT ROBBINS, 1874–1930

S. F. Blake

Charles Albert Robbins was a worthy member of the widely scattered band of amateur botanists who, without the advantage of early scientific training, by a combination of enthusiasm and perseverance have contrived to master their chosen fields and make substantial contributions to botanical knowledge. Equipped with only a common school education, and compelled to devote practically the whole of his life to business, Mr. Robbins nevertheless succeeded in bringing together what is doubtless the largest private collection of *Cladonia* ever formed in this country and in obtaining recognition as the best-informed student of that genus whom America has produced. It is a matter for deep regret that his untimely death at the age of 55, almost immediately after his retirement from business had afforded the leisure for study he had so long desired, has deprived us of the more matured works of wider scope which might confidently have been expected from him.

Charles Albert [Sumner] Robbins was born in Stoughton, Massachusetts, on 9 February 1874, the son of Charles Orlando and Rosella Robbins. Both his parents were natives of Maine, his father's branch of the Robbins family being descended from one of three brothers from England who settled at an early date in Maine, Cape Cod, and Rhode Island respectively. After a grade school education Mr. Robbins entered the grocery business, at first working in Stoughton. In the early 'nineties he moved to Onset, a well-known summer resort section of Wareham, Massachusetts, where he lived for the rest of

his life. For nearly thirty years he conducted a grocery and provision business there in partnership with Arthur B. Hammond, retiring from it after the death of Mr. Hammond, and only about a year before his own death. In 1897 he married Nellie Barnard of Onset. Mrs. Robbins entered fully into her husband's interest in natural history, and accompanied him on nearly all his field trips. On their last excursion to New Hampshire, in October, 1929, Mr. Robbins had trouble with an infected tooth, and on their return to Onset it was found that his aorta was infected. After several months of sickness he died on 22 January 1930, from a combination of angina pectoris and infected aorta, and was buried in the "Neighborhood Cemetery" in East Wareham. Besides his wife, he was survived by two sons, Lloyd and Bruce, his father (since deceased), and a brother. His mother had died only a month before him.

From his parents Mr. Robbins inherited a love of the out-of-doors, although this acquired no definite direction until he was about 30 years of age. About that time his lifelong friend Ernest M. Fullerton of Stoughton aroused in him an active interest in the field study of birds which he kept until the close of his life. Through this interest he came into contact with other students of birds in eastern Massachusetts—Outram Bangs, William Brewster, Walter Faxon, Dr. W. M. Tyler, J. B. Norton, and others,—and with them he made many trips. In the winter he was accustomed to distribute food for the birds in the vicinity of Onset, usually accompanied on such trips by his friend Frank Robbins (not a relative). He was in no haste to publish his observations, and his printed notes on birds, aside from an article on the breeding habits of the piping plover and another on the method of feeding of the red crossbill as studied in a captive bird, are confined to a single short note in the "Auk," several Christmas censuses in "Bird-Lore," and some short articles in a local newspaper. His longest paper, which remains in manuscript, was an annotated list of the winter birds of Wareham containing the names of 103 species.

The interest in *Cladonia* which absorbed the last fifteen years or more of Mr. Robbins' life was awakened in him as a child by the observation of the beautiful scarlet-fruited species, *C. cristatella*, which is so common on decaying stumps and earth throughout New England. When he began seriously to collect lichens about 1915, however, he did not confine his attention to Cladonias, but studied also the arboricolous forms so abundant in Wareham and its vicinity.

At first, for lack of a satisfactory manual, he was compelled to rely on others for the identification of his specimens, particularly Dr. L. W. Riddle, of whose assistance he always retained a grateful memory. As his herbarium of named specimens grew and as his explorations showed him the wealth of Cladonias in his region and the incomplete state of knowledge concerning them, his interests gradually centered on that genus, and by about 1920 he was devoting himself almost entirely to its study. Shortly before the death of Dr. Riddle Mr. Robbins entered into a correspondence with G. K. Merrill, the well-known lichenologist of Rockport, Maine, which continued for five years. Mr. Merrill's identifications and critical notes were of great assistance to Mr. Robbins in the early years of his study, but as his own familiarity with the genus increased differences of opinion arose,—Mr. Robbins estimating the work of Wainio and Sandstede much more highly than did Mr. Merrill,—and their correspondence was broken off abruptly by Merrill in 1925.

Although Mr. Robbins sent a few specimens indirectly to Wainio, the monographer of *Cladonia*, and obtained identifications of them, his principal European correspondent was Heinrich Sandstede of Bad Zwischenahn, Oldenburg, with whom the interchange of specimens and opinions was as easy as it was difficult with Wainio. Their correspondence, begun in 1922, continued practically to the end. To him Mr. Robbins was accustomed to send especially difficult specimens collected by himself or his correspondents, and from him he purchased in 1923 the first eight fascicles (nos. 1–1086) of Sandstede's "Cladoniae exsiccatae." He contributed a number of sets of 40 specimens each to later distributions, receiving in return the fascicles as issued as well as a set of Arnold's beautiful photographs of types and historical specimens of Cladonia.

The vicinity of Wareham with its sand plains, pitch pine woods, and cranberry bogs is rich in Cladonias, and Mr. Robbins found there a fruitful field for his labors. He described three new species and numerous forms from that region, and another species was described from his collections by Wainio. Always pleased to place his knowledge of the genus at the service of others, he rendered much assistance to Dr. Alexander W. Evans in the latter's work on the Cladonias of Connecticut and of North and South Carolina, and many of his new forms have been or will be published by Dr. Evans in his papers on the Cladonias of those regions. He named also the specimens of the

genus collected by A. F. Allen[1] in Quebec, describing from them a new species. On my first visit to Mr. Robbins, in 1924, he persuaded me to collect Cladonias, and for several years I continued to send him material from the District of Columbia and its vicinity and from excursions farther afield. On several occasions I collected with him at Onset, and I recall his pleasure at my chance discovery of a striking new form of *Cladonia cristatella* with orange apothecia, his name for which has not yet been published.

His Cladonia herbarium was, without doubt, the largest private collection of the genus in this country. In addition to a set of Sandstede's Cladoniae Exsiccatae and one of Arnold's Cladoniarum Icones Herbariorum, it contained sets from Dr. Evans collected in New England and the Carolinas; sets of the present writer from Europe, the District of Columbia and vicinity, and the Pacific Coast; a small number of specimens from G. K. Merrill, important because containing fragments of types; a set of A. F. Allen's plants from Quebec; and occasional specimens from others. His own collections, principally from the vicinity of Wareham, Massachusetts, and from Jackson, New Hampshire, where he was accustomed to pass his fall vacations, were very extensive and contained long series of each species selected to show variation. All specimens retained for his herbarium were mounted with glue on small pieces of cardboard, with the data written on the back of the mount and also typed on the front of the envelope. His Cladonia herbarium has been given by his widow to the Farlow Herbarium, with the exception of the sets of Sandstede's Exsiccatae and Arnold's Icones, both of which, already represented there, were acquired by Dr. A. W. Evans for the herbarium of Yale University.

Mr. Robbins' long continued study of Cladonia in Wareham, during which, as he used to remark, he had covered a great part of the area on his hands and knees, made his locality the most carefully investigated region in the United States in respect to its Cladonia flora. His unpublished list of approximately 46 species from Wareham is larger by one than the whole Cladonia flora of Connecticut as reported by Evans. It was his ambition, born of his early struggles with its extremely variable and perplexing species, to produce for the use of other students an up-to-date treatment of the genus for the New England region. Toward this end he prepared keys and descriptions, revising them from time to time as his knowledge increased, but the

[1] A. F. Allen, "Some Cladoniae from the valley of the Cap Chat River and vicinity, Gaspé Peninsula, Quebec," Rhodora **32**: 91–94. *pl. 199.* 1930.

paper never approached final form. He was slow and deliberate in his work, accustomed to go through his extensive series of specimens again and again to test the constancy of supposed characters, and always willing to change his opinion when the facts appeared to require it.

Among the flowering plants, Mr. Robbins devoted particular attention to the asters and goldenrods. His station for *Aster concolor* L. in a field at East Wareham, discovered fifteen years or more ago by Mrs. Robbins, is the only one for this species so far found on the mainland of Massachusetts. *Aster nemoralis* var. *major* Peck (var. *Blakei* Porter), for which he had a station in an open swamp in East Wareham, is less rare but still noteworthy. *Luzula campestris* var. *acadiensis* Fernald, which he collected at Stockton's Point, Wareham, in 1920, has not been found elsewhere south of Maine. None of these records, all represented by specimens in the herbarium of the New England Botanical Club, has been published hitherto. About a year before his death Mr. Robbins became a member of the New England Botanical Club, but, owing to his distance from Boston, he never attended any of its meetings.

In person, Mr. Robbins was of medium height and solidly built, with clean-shaven, ruddy face, blue eyes, and brown hair, which turned to gray in his later years. Sparing of speech, modest, and hospitable, with a quiet sense of humor and a good supply of New England common sense, he was a good companion and a faithful friend.

List of Publications by C. A. Robbins

BOTANY

Some new Cladonias. Rhodora **26**: 145–148. 1924.
Cladonia mateocyatha, a new species, and some variations in C. Beaumontii. Rhodora **27**: 49–51. 1925.
Cladonia apodocarpa: a new species. Rhodora **27**: 210–211. 1925.
The identity of Cladonia Beaumontii. Rhodora **29**: 133–138. *pl. 157.* 1927.
The identity of Cladonia lepidota Fries. Rhodora **31**: 101–106. *pl. 187.* 1929.
Cladonias collected by S. F. Blake in the western United States. Rhodora **33**: 135–139. *pl. 209.* 1931.
(With S. F. Blake.) Cladonia in the District of Columbia and vicinity. Rhodora **33**: 145–159. *pl. 210–212.* 1931.

ORNITHOLOGY

Winter birds at Wareham, Mass. Auk **32**: 499–500. 1915.
A colony of Cape Cod piping plover. Auk **36**: 351–355. 1919.

The advantage of crossed mandibles: a note on the American red crossbill. Auk **49**: 159–165. 1932.

Also, with Frank Robbins et al., several Christmas bird censuses from Wareham, Mass. Bird-Lore **17**: 25. 1915; **18**: 21. 1916; **19**: 15. 1917; **20**: 28. 1918; **22**: 17–18. 1920; **23**: 6. 1921.

Bureau of Plant Industry, Washington, D. C.

Some Weeds in an old Garden.—The writer's property in Milton, Massachusetts, comprises about sixteen acres. The greater part of this has been under cultivation for seventy-five years or more. The original layout has been changed but little and many of the trees have been retained where they grew spontaneously.

Since about 1880 I have planted experimentally many species of trees, shrubs and herbaceous plants, and have grown a great many different sorts of vegetables; also many kinds of mulches and fertilizers have been tried. Thus we see why I have been able to note in Rhodora from time to time some interesting weeds. I now wish to speak of a few weeds which have appeared from 1928 to 1932, not forgetting to thank Messrs. Robinson, Fernald, Weatherby, Johnston and Blake for help in identification.

1. Solanum nigrum L., var. villosum L.; with the type, amongst vegetables, 28 September 1928.

2. Echium plantagineum L.; in a flower border, a single plant, 7 August 1929.

3. Sisymbrium Sophia L.; 29 May 1929 and 14 June 1931, each time a single plant. (Also I have a specimen from C. E. Perkins' collection, "Boston 1882.")

4. Artemisia annua L.; lone weed, flower bed, 25 September 1929.

5. Tagetes minuta L.; vegetable garden, 5 October 1929. Dr. S. F. Blake writes (with my specimens in hand) "*****with very little doubt *T. minuta* L. ***** the heads are too young to make this identification absolutely certain ***** already reported from North Carolina."

6. Sisymbrium orientale L., amongst vegetables, 7 July 1931.

7. Verbesina encelioides (Cav.) B. & H., var. exauriculata Robinson & Greenman. A single plant in a mixed border, 19 July 1932.

8. Eclipta alba (L.) Hassk., lone weed in my strawberry bed, 2 October 1932.

I have put specimens of all in the Gray or The New England Botanical Club Herbaria excepting only *Sisymbrium Sophia* L. of which material was very limited.—Nathaniel T. Kidder, Milton, Massachusetts.

Moss Flora.[1]—Part 3, Vol. III, of Grout's Moss Flora was issued in November. It describes 143 species and varieties, approximately half of which are fully illustrated by excellent line figures reproduced from such standard authorities as Bruch and Schimper, Husnot, Sullivant, Jennings, Dixon, etc., while many are from original drawings by Mrs. Cleaves. Illustrations of those not figured in this part will almost invariably be found in Grout's "Mosses with a Hand-lens and Microscope," to which, in each case, there is a definite reference. Additional authentic illustrations are also cited. The contrasting characters in the keys are, so far as checked, clear and definite; e. g., "large" and "small" are supplemented by definite minimum and maximum measurements. The text and plates are of the same high grade as in earlier parts, and only a very few minor typographical errors have been noted. The genera described are indicated below. The figure following each name indicates the number of species and varieties described under that genus. *Rhytidium* (1), *Rhytidiopsis* (1), *Rhytidiadelphus* (4), *Hylocomium* (5), *Hypnum* (31), *Brotherella* (4), *Heterophyllum* (2), *Sematophyllum* (6), *Homomallium* (3), *Amblystegiella* (4), *Pylaisia* (7), *Platygyrium* (4), *Taxithelium* (1), *Mittenothamnium* (1), *Tripterocladium* (1), *Vesicularia* (4), *Ectropothecium* (1), *Stereophyllum* (2), *Plagiothecium* (31), *Entodon* (11), *Holmgrenia* (5), *Thuidium* (14).—J. F. C.

Hawaiian Weeds.[2]—A bulletin on the Weeds of the Hawaiian Islands, the senior author of which was, for many years, an active member of the New England Botanical Club, will interest some readers of Rhodora. Besides a page of descriptive text each species has a full-page illustration in line-drawing. Naturally, most of the plants are unfamiliar in New England, but *Chenopodium carinatum*, native of Australia, reached Cape Cod before it did Hawaii. And several of our familiar New England weeds are there: *Setaria verticillata, Digitaria sanguinalis, Amaranthus hybridus, Malva rotundifolia*, etc.—M. L. F.

[1] *Moss Flora of North America, North of Mexico*, by A. J. Grout, Ph.D. pp. 115–178, pls. 30–44. Published by the Author, Newfane, Vt. Nov. 1932.

[2] *Weeds of the Pineapple Fields of the Hawaiian Islands*, by Harold St. John and Edward Yataro Hosaka Univ. Hawaii. Research Pub. no. 6, 196 pp. (including illustrations.). Paper-bound, $.75; cloth, $1.75. Publications Office, University of Hawaii, Honolulu, Hawaii.

Volume 35, no. 411, including pages 69–110, 1 portrait and 1 plate, was issued 4 March, 1933.

CATABROSA AQUATICA: FIG. 1, panicle, × 1; FIG. 2, summit of culm, × 6.

C. AQUATICA, var. LAURENTIANA: FIG. 3, panicle, × 1; FIG. 4, summit of culm, × 6.

C. AQUATICA, var. UNIFLORA: FIGS. 5 (European) and 7 (American), panicles, × 1; FIGS. 6 (European) and 8 (American), summits of culms, × 6.

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